

# AMP 200N1.1

## LF SIGNAL & AMPLIFIER DC (0HZ) TO 250KHZ (500KHZ), 800W



### FOR TESTS ACCORDING TO ...

- > Chrysler CS-11809 (2009)
- > Chrysler CS-11979
- > Chrysler DC-11224 Rev.A
- > DaimlerChrysler DC-10614
- > DaimlerChrysler DC-10615
- > DaimlerChrysler DC-11224
- > Fiat 9.90110
- > Ford EMC-CS-2009.1
- > Ford ES-XW7T-1A278-AC
- > Ford FMC1278
- > GLloyd VI-7-2
- > GMW 3097 (2006)
- > GMW 3172
- > ISO 11452-10
- > ISO 11452-8
- > Jaguar JLR-EMC-CS V1.0 Amd 4
- > MAN 3285
- > MBN 10284-2
- > Nissan 28400 NDS 02
- > PSA B21 7110
- > Renault 36.00.808/--G
- > ...

### AMP 200N1.1 - LOW-FREQUENCY SIGNAL / AMPLIFIER FOR SUPPLY SIMULATION AND MAGNETIC FIELD TESTING

The AMP 200N1.1 has been designed as a low-frequency signal source to generate sinusoidal signals used to simulate ripple noise and ground shift noise as required by a variety of standards in the avionics, military and automotive industry. The AMP 200N1.1 is controlled by either the NetWave (for testing avionics, military and nautic standard requirements, e.g German Lloyd VI-7-2) the AutoWave for automotive testing such as e.g. Ford FMC1278. Additionally, the AMP 200N1.1 can be used to generate magnetic fields by means of a radiation loop or small Helmholtz coils as per various standards.

### HIGHLIGHTS

- > Automatic Closed Loop test procedures
- > Built-in DDS sinus signal generator up to 250 kHz
- > High frequency option up to 500 kHz
- > Output voltage max. 140V p-p, 50V rms
- > Output current max. 16A rms
- > Supports magnetic field tests up to 1100 A/m
- > Short-circuit protected

### APPLICATION AREAS



AUTOMOTIVE



MILITARY



AVIONICS

## TECHNICAL DETAILS

## BENEFITS

**AMP 200N1.1 - SIGNAL GENERATOR/AMPLIFIER  
SOLUTION FOR RIPPLE NOISE AND MAGNETIC FIELD  
TESTING**

The AMP 200N1.1 unifies a low-frequency signal generator and a powerful amplifier module giving a maximum amplitude of 140V peak-to-peak as required e.g. by German Lloyd VI-7-2 or by Ford FMC1278. It generates both sinusoidal and transient signals.

Equipped with a DDS it generates any sinusoidal signal with a frequency up to 250kHz (500 kHz with HF option). The AMP 200N1.1 is controlled by the EM TEST AutoWave or the NetWave in order to generate any sinusoidal or non-sinusoidal/transient signals and is therefore fully supported by the autowave.control software with its exhaustive library of pre-programmed standards and its outstanding reporting and documentation capabilities.

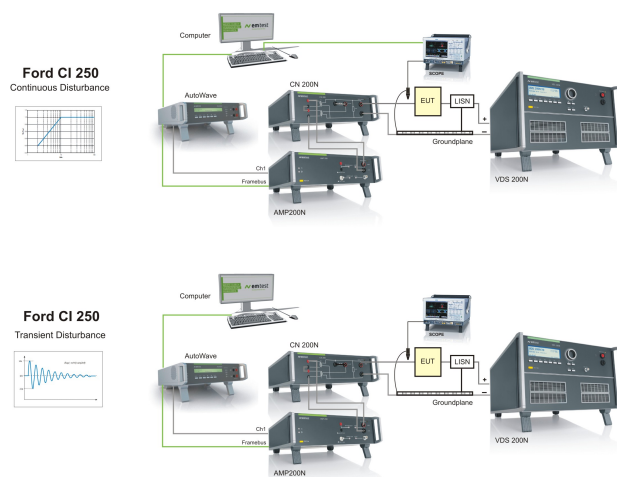
The AMP 200N1.1 can also be used for magnetic field testing using a Radiation Loop and Loop Sensor. Extended by the optional measuring module the AMP 200N1.1 offers means for frequency-selective current measurement, voltage measurement and measurement of the magnetic field strength.

## FORD FMC1278, CI 250 TESTING

**IMMUNITY TO GROUND OFFSET**

The AMP 200N1.1 can be used for testing the immunity to ground offset noise as per Ford FMC1278, CI 250.

Both the continuous as well as the transient signal are generated by means of the AMP 200N1.1, controlled by the AutoWave. The CN 200N1 is used to couple the test signals on to the line under test.



## TECHNICAL DETAILS

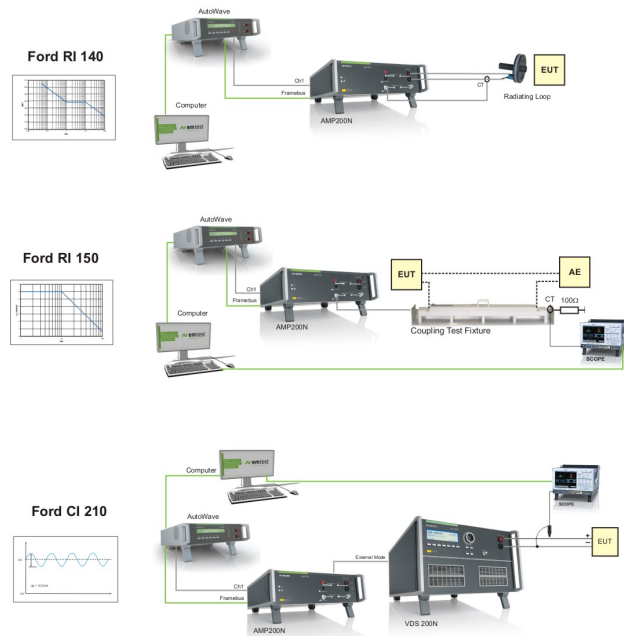
## FORD FMC1278, RI 140, RI 150, CI 210

**MAGNETIC FIELD TESTING (RI 140), CONTINUOUS DISTURBANCE TESTING (RI 150) AND IMMUNITY FROM POWER LINE DISTURBANCES (CI 210)**

The AMP 200N1.1 is designed for immunity testing and magnetic field testing as per Ford FMC1278.  
For RI 140 magnetic field testing a Radiation loop and current clamp to measure the induced current is required.

For RI 150 testing a test fixture is needed to represent the injection loop.

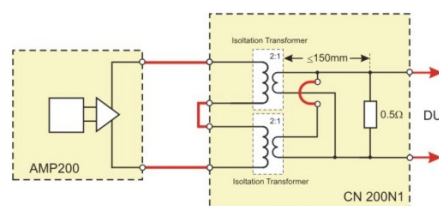
For CI 210 Immunity testing from continuous power line disturbances the AMP 200N1.1 generates the control signal to drive a programmable DC source, e.g. a VDS 200N or VDS 200Q.



## AUXILIARY DEVICES

**CN 200N1 - SINGLE-BOX TRANSFORMER ASSEMBLY FOR LF CONDUCTED IMMUNITY TESTING**

The CN 200N1 is an easy-to-use coupling device consisting of two audio transformers and a 0.5ohm/250watt load resistor configurable as required by Ford FMC1278, Fig. 22-6 for AC ground voltage offset testing. The two transformers need to be connected in series on their primary side, their secondary side is paralleled and loaded by the 0.5ohm non-inductive resistor load.



Ford FMC1278, Figure 22-6

## TECHNICAL DETAILS

## TECHNICAL DATA

## SIGNAL GENERATOR OUTPUT CHARACTERISTIC (BUILT-IN)

|                 |                                                                         |
|-----------------|-------------------------------------------------------------------------|
| Frequency range | DC, 10 Hz - 250 kHz (sinusoidal)<br>DC, 10 Hz - 500 kHz HF Option       |
| Output voltage  | +/-10 V,<br>Programmable for control internal or<br>external amplifiers |

## AMPLIFIER OUTPUT CHARACTERISTICS

|                                 |                                                                                      |
|---------------------------------|--------------------------------------------------------------------------------------|
| Frequency range                 | DC - 250 kHz                                                                         |
| Signal power                    | 800 W (nominal)                                                                      |
| Output voltage                  | 50 Vrms, 140 V(p-p), max. 100 kHz<br>30 Vrms, 100 kHz - 250 kHz                      |
|                                 | Option,<br>30 Vrms, 250 kHz - 500 kHz                                                |
| Output current                  | Max. 16 Arms<br>(voltage low-range 25 V)<br>Max. 8 Arms<br>(voltage high-range 50 V) |
| DC current                      | 25 A, (H-field)                                                                      |
| Output Impedance                | 30 mOhm @ 1 kHz                                                                      |
| Total Harmonic Distortion (THD) | < 0.1 % Load (< 4 ohm, < 100 kHz)                                                    |
| Capacitive load                 | Switchable filter for capacitive loads                                               |
| Protection                      | - Short circuit<br>- Overtemperature                                                 |
| HF Option                       | BW extended to 500 kHz                                                               |

## GENERAL DATA

## INTERFACE

|                  |                                 |
|------------------|---------------------------------|
| Serial interface | Framebus to AutoWave or NetWave |
|------------------|---------------------------------|

## GENERAL DATA

|                |                                                           |
|----------------|-----------------------------------------------------------|
| Dimensions     | 19", 6 HU<br>(500 mm x 449 mm x 286 mm)                   |
| Weight         | Approx. 36 kg                                             |
| Supply voltage | 115 V +10/-02 %, 50/60 Hz or<br>230 V +10/-15 %, 50/60 Hz |
| Input power    | Max. 1,500 VA                                             |
| Fuses          | 16 AT (115 V) or<br>10 AT (230 V)                         |
| Cooling        | Active cooling, air ventilation                           |
| Temperature    | 10 °C - 40 °C                                             |
| Rel. humidity  | Max. 85 %, non-condensing                                 |

## TECHNICAL DETAILS

## OPTIONS

## MEASUREMENTS (OPTIONAL)

|                        |                                                                                                                |
|------------------------|----------------------------------------------------------------------------------------------------------------|
| MU-AMP 200N            | Optional built-in measuring unit;<br>Frequency-selective instrument for<br>voltage, current and magnetic field |
| Frequency range        | 10 Hz - 250 kHz                                                                                                |
| Accuracy               | Better than 5 %                                                                                                |
| Current<br>measurement | External with current clamp:<br>Range 100 mV/A: 1 mA - 30 A rms,<br>Range 10 mV/A: 10 mA - 300 A rms           |
| Voltage<br>measurement | 17 mV - 70 Vrms                                                                                                |

## AMPLIFIER HIGH FREQUENCY OPTION

|                  |                                                            |
|------------------|------------------------------------------------------------|
|                  | Option for extend to 500 kHz,<br>Requires software option  |
| AW-LIC AMP HF    | AutoWave.control software:<br>license option for AMP HF    |
| LIC-1 NetAmpHigh | Net.control software 1-phase:<br>license option for AMP HF |
| LIC-3 NetAmpHigh | Net.control software 3-phase:<br>license option for AMP HF |

## ACCESSORIES

## ACCESSORIES

|                |                                                                                                                                     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Radiating Loop | 120mm radiation loop for magnetic<br>field testing as per Ford FMC1278, RI<br>140<br>1100 A/m up to 3 kHz<br>> 30 A/m @ 100 kHz     |
| Helmholtz coil | HHS 5204-12<br>450 A/m up to 800 Hz<br>10 A/m @ 100 kHz                                                                             |
| Loop Sensor    | To measure the magnetic field<br>strength                                                                                           |
| CN 200N1       | Transformer assembly with built-in<br>0.5ohm/250W resistive load as per<br>Ford FMC1278, German Lloyd VI-7-2<br>and other standards |

## TECHNICAL DETAILS

## STANDARD TESTS SUPPORTED WITH THE NETWAVE-SERIES

## STANDARD TESTS AS PER RCTA DO-160 E/F/G (SECT. 18)

|                 |                                   |
|-----------------|-----------------------------------|
| Cat. R/K        | AC (5 V - 170 V), 700 Hz - 32 kHz |
| Cat. R/B/Z      | DC (14/28/270 V), 10 Hz - 150 kHz |
| Level control   | Closed Loop                       |
| Frequency steps | As specified by the test plan     |

## STANDARD TESTS AS PER ABD0100.1.2 G, CONDUCTED IMMUNITY

|                 |                                   |
|-----------------|-----------------------------------|
| Cat. R/K        | AC (5 V - 110 V), 700 Hz - 32 kHz |
| Cat. R/B/Z      | DC (14/28/270 V), 10 Hz - 150 kHz |
| Level control   | Closed Loop                       |
| Frequency steps | As specified by the test plan     |

## STANDARD TESTS AS PER ABD0100.1.8 E, CHAPT. 16, RIPPLE VOLTAGE

|                 |                               |
|-----------------|-------------------------------|
| Level control   | Closed Loop                   |
| Frequency range | 10 Hz - 150 kHz               |
| Frequency steps | As specified by the test plan |
| Test levels     | 0.004 Vpp - 4.0 Vpp           |

## STANDARD TESTS AS PER ABD0100.1.8.1, RIPPLE VOLTAGE

|                 |                               |
|-----------------|-------------------------------|
| Level control   | Closed Loop                   |
| Frequency range | 10Hz - 150kHz                 |
| Frequency steps | As specified by the test plan |
| Test levels     | 0.6 Vpp - 4.0 Vpp             |

## STANDARD TESTS AS PER ABD0100.1.8.1, VOLTAGE DISTORTION

|                 |                                |
|-----------------|--------------------------------|
| Tests AC        | SVF 107/303, SCF 107, SVFH 107 |
| Tests DC        | LDC 103                        |
| Level control   | Closed loop                    |
| Frequency range | 10 Hz - 150 kHz                |

## STANDARD TESTS SUPPORTED WITH THE NETWAVE-SERIES

## STANDARD TESTS AS PER MIL STD 461 E/F/G

|                 |                                       |
|-----------------|---------------------------------------|
| CS 101          | Voltage ripple AC/DC, 30 Hz - 150 kHz |
| CS 109          | Structure current, 60 Hz - 100 kHz    |
| RS 101          | H-Field (Army, Navy), 30 Hz - 100 kHz |
| Level control   | Closed Loop / Calculation method      |
| Frequency steps | As specified by the test plan         |

## STANDARD TESTS AS PER MIL-STD-704 A/B/C/D/E/F

|                 |                           |
|-----------------|---------------------------|
| Tests AC        | SAC 106, SVF 106, SXF 106 |
| Tests DC        | LDC 103/104, HDC 103/104  |
| Level control   | Substitution method       |
| Frequency range | 10 Hz - 150 kHz           |

## STANDARD TESTS AS PER GERMAN LLOYD VI-7-2, CONDUCTED IMMUNITY

|                 |                                           |
|-----------------|-------------------------------------------|
| Frequency steps | As specified by the test plan             |
| Test AC         | Table 3.30 (up to 230 V), 100 Hz - 10 kHz |
| Test DC         | Table 3.29, 50 Hz - 10 kHz                |
| Level control   | Closed Loop / Calculation method          |

## TECHNICAL DETAILS

## STANDARD TESTS WITH AUTOWAVE

## SAE J1113-2 - CONDUCTED IMMUNITY

|                  |                                    |
|------------------|------------------------------------|
| Injected current | Limited to max. 1A during test     |
| Level control    | Closed Loop / Substitution method  |
| Frequency range  | 15 Hz - 80 kHz (250 kHz)           |
| Frequency steps  | As specified by the test plan      |
| Test levels      | 0.15 Vpp/0.5 Vpp/ 1.0 Vpp/ 3.0 Vpp |

## SAE J1113-22 - RADIATED MAGNETIC FIELD

|                 |                               |
|-----------------|-------------------------------|
| Level control   | Substitution method           |
| Frequency range | 15Hz - 30kHz                  |
| Frequency steps | As specified by the test plan |
| Test levels     | 10 uT - 100 uT                |

## ISO 11452-8 - MAGNETIC FIELD

|                 |                                                |
|-----------------|------------------------------------------------|
| Level control   | Calculation method;<br>verified by Loop sensor |
| Frequency range | 15 Hz - 150 kHz                                |
| Frequency steps | As specified by the test plan                  |
| Test levels     | 0.3 A/m - 1,000 A/m                            |

## STANDARD TESTS WITH AUTOWAVE

## ISO 11452-10 - CONDUCTED IMMUNITY

|                  |                                     |
|------------------|-------------------------------------|
| Level control    | Closed Loop / Substitution method   |
| Frequency range  | 15 Hz - 250 kHz                     |
| Frequency steps  | As specified by the test plan       |
| Test levels      | 0.15 Vpp/ 0.5 Vpp/ 1.0 Vpp/ 3.0 Vpp |
| Source impedance | less than 0.5 ohm                   |

## STANDARD TESTS AS PER FORD FMC1278

|                 |                                                                                                                                    |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------|
| RI 140          | Magnetic field Immunity,<br>10 Hz - 100 kHz                                                                                        |
| RI 150          | Coupled Immunity, 1 kHz - 100 kHz                                                                                                  |
| CI 210          | Immunity to Continuous Power Line<br>Disturbances, 10 Hz - 100 kHz                                                                 |
| CI 250          | Immunity to Ground Voltage Offset<br>Continuous, 2 kHz - 100 kHz<br>Immunity to Ground Voltage Offset<br>Transient, Sequence 1 - 4 |
| Level control   | Closed Loop / Calculation method                                                                                                   |
| Frequency steps | As specified by the test plan                                                                                                      |

## TECHNICAL DETAILS

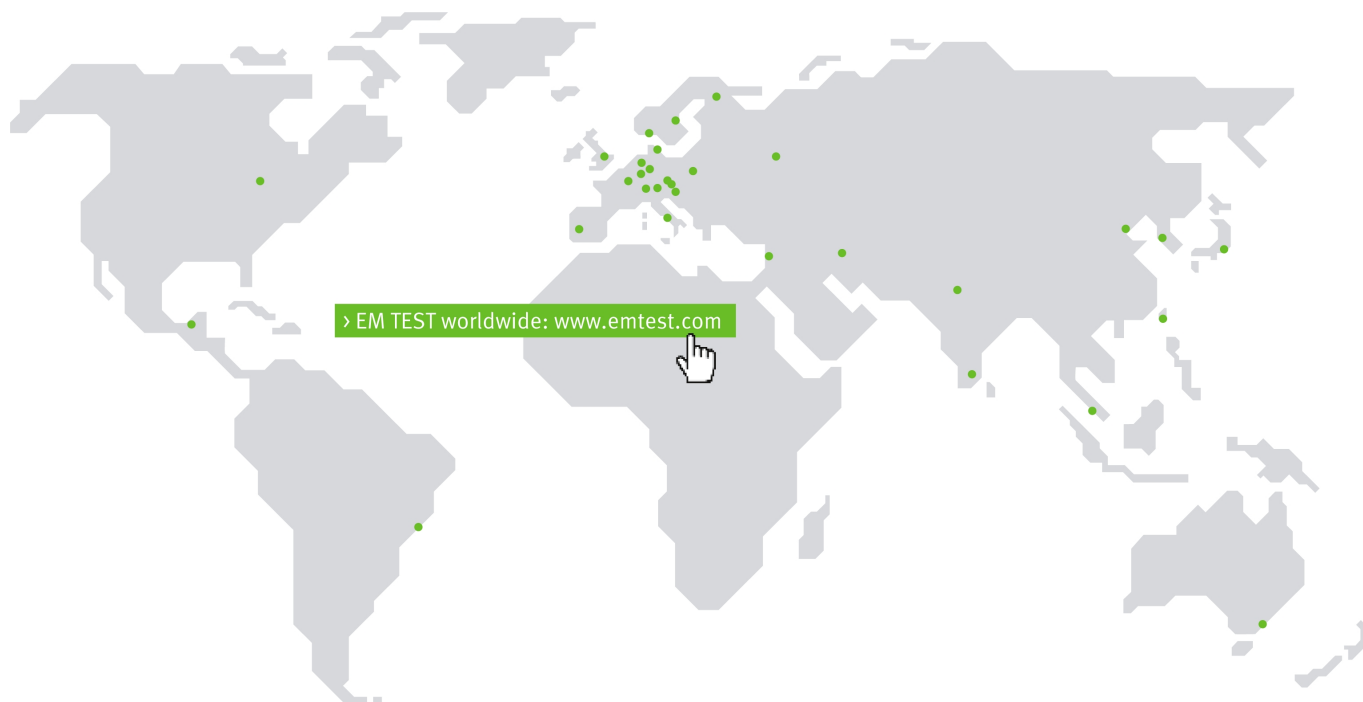
## MORE STANDARD TESTS...

| ADDITIONAL AUTOMOTIVE STANDARDS |                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| BMW                             | GS 95002-2 (2013-07)<br>GS 95025-1 (2012-05)                                                                                                            |
| Case New Holland                | ENS0310 (2009-03)<br>ENS0310 (2010-01)                                                                                                                  |
| Chrysler LLC                    | DC-10615 (Rev. E, 2007-12)<br>DC-11224 (Rev. A, Add., 2008-04)<br>CS-11809 (2009-05)<br>CS-11979 (Change A, 2010-04)                                    |
| DaimlerChrysler                 | DC-10614 (Rev. A, 2004-01)<br>DC-10615 (Rev. B, 2004-08)<br>DC-10615 (Rev. C, 2006-04)<br>DC-10615 (Rev. D, 2007-05)<br>DC-11224 (Rev. A, 2007-05)      |
| FIAT                            | 9.90110 (Rev. 11, 2003-07)<br>9.90110 (Rev. 12, 2006-02)<br>9.90110 (Rev. 13, 2007-03)<br>9.90111 (Rev. 1, 2010-05)                                     |
| Ford                            | ES-XW7T-1A278-AC (2003-10)<br>Ford EMC-CS-2009.1<br>Ford FMC1278                                                                                        |
| General Motors                  | GMW 3097 (Rev. 4, 2004-02)<br>GMW 3097 (Rev. 5, 2006-07)<br>GMW 3097 (Rev. 5, 2012-04)                                                                  |
| IVECO                           | 16-2119 (2008-11)<br>16-2119 (2010-05)                                                                                                                  |
| Jaguar/LandRover                | EMC-CS-2010JLR (2010-06)<br>EMC-CS-2010JLR V.1.1 (2011-01)<br>JLR-EMC-CS (2013-11)                                                                      |
| Mazda                           | MES PW 67602 (207-03)                                                                                                                                   |
| Mitsubishi                      | ES-X82114 (Rev. C, 2007-04)<br>ES-X82114 (Rev. D, 2009-03)<br>ES-X82115 (Rev. C, 2007-04)<br>ES-X82115 (Rev. D, 2009-03)<br>ES-X82115 (Rev. E, 2010-10) |
| Mercedes-Benz                   | MBN 10 284-2 (2008-03)<br>MBN 10 284-2 (2011-04)<br>MBN 10 284-4 (2011-04)                                                                              |
| Nissan                          | 28 401 NDS02 [2] (2003-10)<br>28 401 NDS02 [3] (2006-03)<br>28 401 NDS02 [4] (2008-08)<br>28 401 NDS02 [5] (2010-12)                                    |

## MORE STANDARD TESTS...

| ADDITIONAL AUTOMOTIVE STANDARDS |                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Paccar                          | CPP0016 (2011-10)                                                                                                                                              |
| PSA                             | B21 7110 (Rev. A, 2004-07)<br>B21 7110 (Rev. B, 2005-05)<br>B21 7110 (Rev. C, 2008-03)<br>B21 7110 (Add. Rev. C, 2010-05)<br>B21 7110 (Rev. D, 2012-07)        |
| Renault                         | 36.00.808/--G (2004-02)<br>36.00.808/--H (2007-06)<br>36.00.808/--J (2008-04)<br>36.00.808/--K (2009-03)<br>36.00.808/--L (2010-12)<br>36.00.808/--M (2012-07) |
| Tata Motors                     | TST/TS/WI/257 (2008-07)                                                                                                                                        |
| Volkswagen                      | VW TL 825 66 (2006-02)<br>VW TL 825 66 (2011-05)                                                                                                               |
| Volvo                           | STD 515-0003 (Rev. 3, 2008-03)<br>STD 515-0003 (Rev. 4, 2009-10)                                                                                               |

# COMPETENCE WHEREVER YOU ARE



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Information about scope of delivery, visual design and technical data correspond with the state of development at time of release. Subject to change without further notice.